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Robert H. Bachman  
BACHMAN & LaPOINTE, P.C.  
Suite 1201  
900 Chapel Street  
New Haven, CT 06510-2802

EXAMINER

MOUTTET, BLAISE L

ART UNIT

PAPER NUMBER

2853

DATE MAILED: 04/23/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/873,664

Applicant(s)

HOWALD ET AL.

Examiner

Blaise L Mouttet

Art Unit

2853

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 15 August 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-14 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4 and 6-14 is/are rejected.
- 7) ☒ Claim(s) 3 and 5 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 June 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

## **DETAILED ACTION**

### ***Specification***

1. The disclosure is objected to because of the following informalities:

On page 11, line 9 the quote mark for "tuning fork" is mispositioned.

On page 16, line 19 "angels" should read --angles--.

Appropriate correction is required.

### ***Claim Objections***

2. Claims 1-9, 11 and 12 are objected to because of the following informalities:

In claim 1, line 12 "in a manner known per se" should be deleted because it causes confusion as to whether or not the hardening and removing of the photostructural material are limited to any cited hardening and removal technique. Since the applicant has not clearly specified what any such "known per se" method would constitute any method step in which the exposed photostructural material is hardened and the unexposed material removed would be compatible with the claimed step.

In claim 2, line 2 ",in particular" should be deleted since it makes it unclear as to whether the limitation of the directed manner being in a direction diagonal or inclined towards the tip is to be considered as a positive limitation of the claim.

In claim 5, line 2 "the directing of the carrier" should more properly read --the positioning of the carrier-- in accordance with the prior recitation of the step.

In claim 5, line 4 "latter" should read --mask-- or --exposure mask-- to improve the clarity of the claim.

In claim 7, line 2 "the photosensitive resist" lacks antecedent basis. The examiner assumes the applicant means to refer to "the photostructurable material" previously claimed. This claim will be examined under 35 USC 102 and 35 USC 103 in light of this interpretation.

In claim 7, line 3 "the so-called" should be deleted since spin coating had established a well recognized meaning in the art at the time of the invention.

In claim 7, line 2, claim 8, line 2 and claim 11, line 4 "preferably" should be deleted since the use of this word produces doubt as to whether or not the claim is actually so limited.

In claim 11, lines 5-6 ",in particular" should be deleted since it makes it unclear as to whether the limitation of the carrier forming a cantilever is a positive limitation of the claim.

In claim 11, line 6 "the cantilever" should read --a cantilever-- since this is a newly claimed limitation with no antecedent basis.

In claim 12, lines 3-4 "a process known per se from the production of semiconductors" should more concisely read as --a semiconductor production process-- since there is no indication as to how "known per se" is limiting.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

3. Claims 8, 13 and 14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 8 the applicant claims both a broad (less than 1 micron) and narrow (approximately 0.7 microns) range in the same claim leading to doubt as to which range the claim encompasses. It is suggested that applicant either write the narrower claim limitation as a further dependent claim or select either the broad or narrow range for examination. For present purposes of examination under 35 USC 102 and 35 USC 103 the broader range will be considered the limiting range of claim 8. See MPEP 2173.05(c).

Claims 13 and 14 provide for the use of a tip or probe, but, since the claims do not set forth any steps involved in the method/process, it is unclear what method/process applicant is intending to encompass. A claim is indefinite where it merely recites a use without any active, positive steps delimiting how this use is actually practiced.

Claims 13 and 14 are rejected under 35 U.S.C. 101 because the claimed recitation of a use, without setting forth any steps involved in the process, results in an improper definition of a process, i.e., results in a claim which is not a proper process claim under 35 U.S.C. 101. See for example *Ex parte Dunki*, 153 USPQ 678 (Bd.App.

1967) and *Clinical Products, Ltd. v. Brenner*, 255 F. Supp. 131, 149 USPQ 475 (D.D.C. 1966). See MPEP 2173.05(q).

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 4, 9 and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Borysko US 4,587,202.

Borysko discloses, regarding claim 1, a process for producing very fine tips (20) made from a photostructurable material (photoresist) on a carrier (metal sheet) characterized in that

the carrier (metal sheet) is positioned between front and back exposure masks whose exposure sections correlate to the tips to be produced (column 3, lines 16-31),

the photostructurable material (photoresist) is applied onto the carrier (metal sheet) (column 3, lines 3-5),

an exposure of the photostructurable material occurs via the exposure masks (column 3, lines 34-43),

the exposed photostructural material is hardened by heat treatment and the unexposed material removed (column 3, lines 44-57), and

the carrier with the tips (as shown in figure 1) and the exposure masks are separated from one another to form the finished product (this is inherent to the process as described in column 3, lines 60-65 since in order to remove the left over photoresist the masks used to define the photoresists also have to be removed).

Regarding claim 4, the metal sheet carrying the tip to be produced is positioned on top of the lower exposure mask (column 3, lines 25-29).

Regarding claim 9, the shape and section of the masks are selected such that a tip developed has a predetermined edge angle as shown in figure 2.

Borysko discloses, regarding claim 10, a process for producing very fine tips made from a photostructurable material (photoresist) on a carrier (metal sheet) comprising:

providing a multitude of carriers (30) positioned on a wafer (28) in an undivided manner (as shown with respect to figure 1 the carriers consist of the base rows 30 which are initially provided in an undivided manner as part of metal wafer 28),

arranging exposure masks provided with a multitude of exposure sections positioned correspondingly (column 3, lines 20-30),

conducting a simultaneous exposure of all said provided carriers (30) on said wafer (28) via said exposure masks (column 3, lines 34-43), hardening said exposed photostructurable material (column 3, lines 47-50) and removing any unexposed photostructurable material (column 3, lines 44-47), and

separating said exposure masks from the wafer (28) (this is inherent to the process as described in column 3, lines 60-65 since in order to remove the left over photoresist the masks used to define the photoresists also have to be removed).

(It is noted by the examiner that while the applicant has described an intended use of the fine tips produced by the process steps within the preambles of claims 1 and 10 the statement of purpose of the final product does not materially limit the process of manufacture of the product. See MPEP 2111.02.)

5. Claims 11 and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Akamine et al. US 4,943,719.

Akamine et al. discloses, regarding claim 11, a probe characterized in that a tip (32) made from a photosensitive resist is produced (column 4, lines 36-39) and mounted on a silicon carrier (14) forming a cantilever of a scanning probe microscope (figure 11).

Regarding claim 12, the tip made from the photosensitive resist is made by means of a semiconductor production process (i.e. etching).

(It is noted by the examiner that product claims are not limited to manufacturing steps used to produce the product but only to the structure implied by any recited manufacturing limitations. See MPEP 2113.)



***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Borysko US 4,587,202 in view of Borysko et al. US 5,057,401.

Borysko '202 discloses the claimed steps except for the step that the exposure occurs in a directed manner in a direction inclined towards the tip.

Borysko et al. '401 recognizes this deficiency in Borysko '202 (column 1, lines 44-51) and provides directed exposure to remedy the problem (column 3, lines 29-44).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to implement the directed exposure of Borysko et al. '401 in the process of Borysko '202.

The motivation for doing so would have been to produce sharp tips that achieve ease of penetration as suggested by column 1, lines 44-51 of Borysko et al. '401.

7. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Borysko US 4,587,202 in view of Belcher et al. US 5,587,090.

Boysko discloses the claimed steps except for providing a separation layer provided for a facilitated separation of the carrier having the tip from the exposure mask.

Belcher et al. teaches that a separation layer is useful to facilitate release of a mask from a substrate (column 7, lines 42-57).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to provide a separation layer as taught by Belcher et al. to facilitate the separation of the carrier and mask of Boysko.

The motivation for doing so would have been to facilitate release of the mask as suggested by column 7, lines 42-57 of Belcher et al.

8. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Borysko US 4,587,202 in view of Andreoli et al. WO 99/56176.

Borysko teaches that any one of a variety of coating methods and materials can be used to apply the photostructurable material (column 2, line 64 - column 3, line 3).

Borysko fails to disclose using spin coating to apply SU-8.

Andreoli et al. discloses utilizing spin coating to apply photoresist (page 8, lines 6-9) and using SU-8 as the photoresist (page 3, lines 20-22).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to use spin coating to apply the photostructurable material of Borysko since this was an art recognized equivalent method of coating photostructurable material as taught by Andreoli et al.

It would have been obvious to a person of ordinary skill in the art at the time of the invention to apply SU-8 as the photostructurable material of Borysko to reduce material cost as taught by page 3, lines 20-22 of Andreoli et al.

9. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Borysko US 4,587,202 in view of Widmann et al. US 3,644,134 and Borysko et al. US 5,057,401 and Kado et al. US 5,239,863.

Borysko '202 discloses the claimed invention except that the exposure mask is made from quartz and that the exposure section provides the tip with a radius of curvature less than 1 micron.

Widmann et al. discloses that a quartz mask provides several advantages including ease of cleaning, reuse, stability of mask dimensions and long life (column 2, lines 37-53).

Borysko et al. '401 teaches that the process of Borysko '202 is applicable to a wide variety of fields concerned with the manufacture of fine tips using photoetching techniques (column 2, line 66 - column 3, line 5).

Kado et al. discloses the manufacture of fine tips using photoetching in the field of scanning probe microscopes in which it is desirable to have a tip with a small radius of curvature less than a micron to achieve high resolution scanning (column 1, lines 25-37).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to utilize a quartz mask as taught by Widmann et al. as the exposure mask of Borysko '202.

The motivation for doing so would have been in order to provide ease of cleaning, reuse, stability of dimensions and long life to the mask as taught by column 2, lines 37-53 of Widmann et al.

It would have been obvious to a person of ordinary skill in the art at the time of the invention to generate the tip of Borysko '202 with a radius of less than 1 micron as taught by Kado et al. to be utilized in the field of probing microscopes given the suggestion of Borysko '401.

The motivation for doing so would have been to produce a high resolution scanning probe to detect minute properties of a sample as taught by column 1, lines 26-37 of Kado et al.

***Additional Prior Art***

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Micromachined Transducers Sourcebook by Kovacs, pgs 146-148 provides some background material on sharp tip micromachining as performed by the prior art.

An Introduction to Microelectromechanical Systems Engineering by Maluf, pgs 192-196 provides some background material on sharp tip micromachining as performed by the prior art.

Bayer et al. US 5,253,515 discloses the utilization of a replaceable probe in a cantilever seat for a probe microscope.

Van Der Wilde US 5,936,237 discloses using photoresist materials to form the tip of a silicon cantilever (column 14, lines 28-42).

***Allowable Subject Matter***

11. Claims 3 and 5 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

The primary reason for the indication of the allowability of claim 3 is the inclusion therein, in combination as currently claimed, of the step characterized in that the exposure occurs at an angle of approximately 30 degrees to a perpendicular line in

relation to the exposure mask and/or the surface of the carrier. This limitation is found in claim 3 and is neither disclosed nor taught by the prior art of record, alone or in combination.

The primary reason for the indication of the allowability of claim 5 is the inclusion therein, in combination as currently claimed, of the step characterized in that prior to the positioning of the carrier a small amount of the photostructurable material is applied onto the exposure mask so that the carrier adheres to the mask. This limitation is found in claim 5 and is neither disclosed nor taught by the prior art of record, alone or in combination.

In addition the examiner recognizes clear differences between the disclosed invention and the prior art which are not reflected in the claim language. The examiner suggests the following amended versions of claims 1 and 11 to more clearly define applicant's invention in light of the prior art.

1. A process for producing and/or repairing very fine tips made of a photostructurable material on a carrier, characterized in that

the carrier is positioned on a first side of an exposure mask whose exposure section correlates to the tip to be produced or repaired,

the photostructurable material is applied onto the first side of the exposure mask and/or the carrier,

an exposure of the photostructurable material occurs via the exposure mask from a second side opposite the first side,

the exposed photostructurable material is hardened and the unexposed material removed, and

the carrier with the tip and the exposure mask are separated from one another.

10. A process for producing and/or repairing very fine tips made of a photostructurable material on a carrier, comprising:

providing a multitude of carriers positioned on a wafer in an undivided manner, arranging an exposure mask provided with a multitude of exposure sections positioned in correspondence with the multitude of carriers so that the carriers are positioned on a first side of the exposure mask,

applying said photostructurable material onto the first side of said exposure mask and/or said carriers,

conducting a simultaneous, inclined or diagonal exposure of all said provided carriers on said wafer from a second side, opposite the first side, of said exposure mask, hardening said exposed photostructurable material and removing any unexposed photostructurable material to form said fine tips, and

separating said exposure mask from the wafer.

The above suggestion differentiates claims 1 and 10 from the prior art by specifying that the fine tips are made **of** a photostructurable material rather than **from** a photostructurable material and by the specification of which side of the mask the

process steps are performed as indicated in the steps shown in figure 1 of the applicant's drawings.

The examiner recognizes that the allowable subject matter provides numerous advantages to the art including, but not limited by, flexibility in the production process and the ability to repair or place the fine tips on a variety of already existing structures.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

#### ***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Blaise Mouttet whose telephone number is (703) 305-3007. The examiner can normally be reached on Monday-Friday from 8:30 a.m. to 5:00 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Russell Adams, Art Unit 2853, can be reached at (703) 308-2847. The fax phone number for the organization where this application or proceeding is assigned is (703) 305-3432.



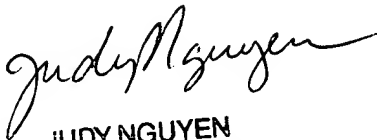
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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Blaise Mouttet April 17, 2003

BM 4/17/2003

  
JUDY NGUYEN  
PRIMARY EXAMINER